A report of a probable unprovoked attack by an Australian freshwater crocodile at Lake Argyle in Western Australia

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Crocodilians are among the few non-venomous reptilian species that can cause severe damage to humans through a bite alone. Although all crocodilians are capable of harming humans, of the 24 species of crocodilian, only ten have been reported to carry out unprovoked attacks on humans. Of these species, attacks by the saltwater crocodile *Crocodylus porosus*, Nile crocodile *C. niloticus* and American alligator *Alligator mississippiensis* are the most widely known (e.g. Fergusson 2004; Caldicott *et al.* 2005; Langley 2005). Less commonly implicated in attacks are the American crocodile *C. acutus* (Sigler 2000; Garcia-Grajales 2008); C. johnstoni (Hines and Skroblin, 2010) Morelet's crocodile *C. moreletii* (Marlin *et al.* 1995); mugger *C. palustris* (Vyas 2008); Indian gharial *Gavialis gangeticus* (Bustard and Singh 1982); black caiman *Melanosuchus niger* (Hall 1991; Evans and Wilkinson 1997) and false gharial *Tomistoma schlegelii* (Rachmawan and Brend 2009). Additionally, provoked bites under captive conditions have been reported for other species such as the common caiman *Caiman crocodilus* (Hertner 2006), and aggressive attacks towards humans have been attempted by nest-guarding females of some species (Shine 1988).

Throughout its range, the saltwater crocodile *C. porosus* is widely known for its attacks on humans (comprehensive review by Caldicott *et al.* 2005). In contrast, the sympatric Australian freshwater crocodiles *C. johnstoni* are generally considered harmless to humans unless provoked (Richardson *et al.* 2002). Otherwise known as Johnston's river crocodile, *C. johnstoni* is endemic to mainland northern Australia (Queensland, Northern Territory and Western Australia). It is a slender-snouted species and possesses sharp and long anterior mandibular teeth (Fig 1). The slenderness of the snout theoretically allows the tip of the jaws to be moved very rapidly through the water, an advantage for an animal hunting small agile prey (McHenry *et al.* 2006). This morphology is usually thought to reflect piscivory (Webb *et al.* 1982; Pooley, 1989). Individuals primarily inhabit freshwater lakes, swamps, and rivers, but can also be found in tidal areas. *C. johnstoni* is a medium-sized crocodile with most adults attaining 1.5-2m in total length, though some individuals can reach 3 m.

The incident I report took place at Lake Argyle in Western Australia. Lake Argyle, with an area of 880 km^2 at normal water level, is the largest human-made lake in Australia and is set in the rugged Kimberley outback. The lake contains one of the largest populations of *C. johnstoni* anywhere in Australia - the resident non-hatchling population was estimated to be 25,000 in 1989 (G Webb Pty Ltd 1989) and has increased since (WMI 2005, 2009). The human presence in the lake is limited to tourism, recreational and commercial catfish fishery, most of which are highly seasonal.

The crocodile attack took place on 18 April 2009 off a rocky beach of Northern Lake Argyle, ~4 km south of the boat ramp (16°09´25´S, 128°44´16´E). It was a cloudy day with a mean maximum day temperature of 34°C. The victim was a 52 yr old male (173 cm, 85 kg). On the day of the incident he and a group of friends and family had anchored their boat and made a few dives and short swims in ~8 m deep water, 12-13 m from the shore. At 1600 hrs (about 2hrs prior to sunset under bright early afternoon light), after being in the water for approximately five minutes, the victim lay on his back on the water surface for 30 seconds, and had then gone into a backward somersault to commence swimming back to the boat. The attack took place halfway through the somersault.

Once attacked, the victim was disoriented and had difficulty maintaining buoyancy. He thought initially that the propeller of a passing boat had hit him and, although he had difficulty moving his left hand, he managed to swim to the boat anchored ashore. Within an hour of the attack, the victim was taken to the Lake Argyle Medical Muster station and subsequently to the

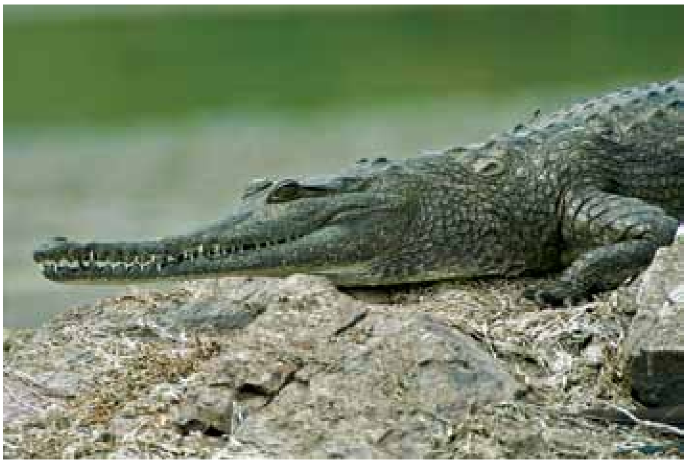

Figure 1. *Crocodylus johnstoni* is a slender-snouted species that possesses sharp and long anterior mandibular teeth. Photo, R. Somaweera.

general hospital in Kununurra. He had puncture marks to the left side of his chest, cuts (regarded as claw marks) in the right shoulder blade and three deep slashes to the left underarm (Figs 2A and 2B). He also had three cracked ribs from the force of the attack. The stitches were left for 2-3 weeks and the wounds were healed completely after approximately three months, with some lingering tenderness. Oral antibiotics were only given for the first 10 days.

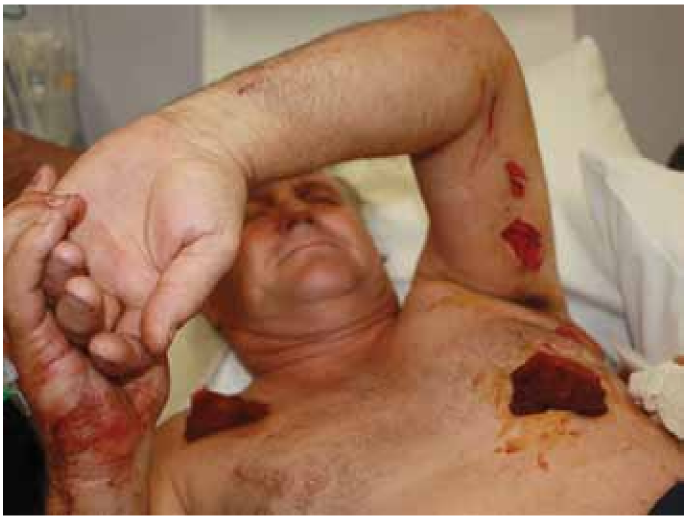

Figure 2A. Bite marks on the victim before treatment. Photo, S. Rushby

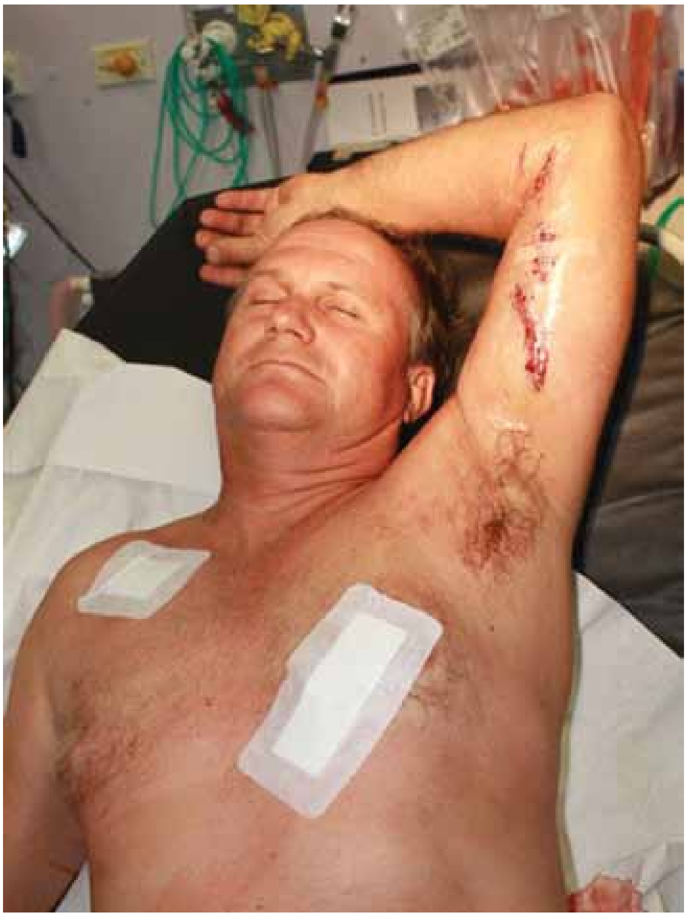

Figure 2B. Victim after treatment for the crocodile attack. Photo, S. Rushby

Since neither the victim nor the bystanders saw the attacking animal, it is difficult to determine the identity of the crocodile. However, given the characteristics of the wounds (shape, size and distribution of the puncture marks) the medical staff at the general hospital in Kununurra concluded it to be an attack by a freshwater crocodile. The area where the attack took place is close to several sheltered bays with a high density of freshwater crocodiles (Somaweera unpublished data). The site is 400-500 m away from 'Crocodile Bay', so named due to the large number of freshwater crocodile nests found in the bay during the nesting season (August-September). Moreover one of the onlookers had seen a large freshwater crocodile nearby when the boat was parked initially. Nevertheless the victim and members of his family are long-term residents of the area and have swum in the lake in afternoons for over 15 years without any previous encounters.

Substantiated unprovoked attacks by freshwater crocodiles Australian freshwater crocodiles on humans are rare ('unprovoked' defined as incidents where the accident occurred without motivation or provocation: not attempting to catch a crocodile or not making physical contact with the crocodile, such as stepping on it, before the attack). Behavioural and dietary aspects may contribute towards *C. johnstoni* being considered to pose less danger to humans.

1. Behaviour – *C. johnstoni* shows considerable territorial behaviour both under captivity (Dunn 1981) and in wild (Webb and Manolis 1983) and may conduct open-mouth attacks in short lunges towards intruders (Johnson 1973). However, it is a gregarious species and more tolerant of conspecifics and the sympatric *C. porosus* (Webb and Manolis 1998). Freshwater crocodiles do not usually attend to, or aggressively guard, their nests in the wild, though some females may actively guard the hatchling pods (Webb *et al.* 1983). The reaction of the guarding female when nurseries are approached may vary from fleeing (Somaweera pers. obs.) to lunging with open mouth (C. Manolis pers. comm.). However, the distress calls of their young do not usually cause any attack responses in the females. The level of wariness in *C. johnstoni* differs with the level of human interactions - in most areas, they are wary as a result of human contact over many years and there is a selection towards inherent wariness. In areas essentially uninhabited by humans over decades, most individuals are not wary and can be approached to within 1-2 m before they dive or swim away (Webb 1985).
2. Food - *C. johnstoni* is an opportunistic predator at the water's edge. The taxonomic range of prey is wide and includes invertebrates and vertebrates from both terrestrial and aquatic environments. When compared with other crocodilians of similar body size, they feed on smaller prey items (Webb *et al.* 1982; Tucker *et al.* 1996). The adults are predominantly piscivorous, but medium-sized mammalian prey, such as wallabies, can be taken (Webb and Manolis 1998; Somaweera pers. obs). Regardless, adult humans remain well outside the size range of prey items in this species.

Nevertheless, few reports of unprovoked attacks by Australian freshwater crocodiles on humans exist (see review by Hines and Skroblin 2010 ince this article was submitted). In their book on Australian crocodiles, Webb and Manolis (1998) reported four records of unprovoked attacks on swimmers by wild C. *johnstoni* since the late 1980s. In 1987, a person was bitten on the leg by a one metre long freshwater crocodile, causing substantial lacerations (Hermes 1987). This incident occurred in a city street in Cairns, Queensland during heavy rains that had driven the crocodile from the sewer pipes in the city. In September 2003, an apparently unprovoked attack took place at the Barramundi Gorge in Kakadu National Park, Northern Territory. It was reported that a 1.5m freshwater crocodile submerged and attacked a man, causing a puncture mark to his chest and a large cut to his hand (ABC News 2003). A 16 year old trying to cross the flooded Katherine river (Northern Territory) in April 2006 was bitten twice by a 2 m long freshwater crocodile, leaving four minor puncture wounds on his back and arm (CSG 2006). Three other cases of attacks: two in 1988 and 1990 at Twin Falls in the Kakadu National Park, Northern Territory (Lindner 2004) and one in January 2007 at Ivanhoe Crossing in Kununurra, Western Australia (Anonymous 2007), were attributed to freshwater crocodiles, but as to whether these were freshwater or saltwater crocodiles was not clear (Caldicott *et al.* 2005; Anonymous 2007). A few other unsubstantiated stories of freshwater crocodile attacks have occurred, but none could be verified due to the lack of further information. From the available data, most unprovoked attacks have being caused by animals ~2 m in length, thus most likely mature males.

The presence of saltwater crocodiles in Lake Argyle cannot be completely ruled out. In 1989, spotlighting surveys revealed four saltwater crocodiles in the southern bays at the lake (G. Webb Pty Ltd 1989). In the early 1990s, a fisherman caught a 1.2 m saltwater crocodile in nets in the Behn River, which joins the lake (C. Sharpe pers. comm. 2010). In an anecdotal report in 2006, a ~2 m saltwater crocodile was found dead after becoming entangled in a fishing net and drowning in Pannikin Bay in the northern part of Lake Argyle. After an expedition to look for saltwater crocodiles in the upper Ord River, Kelly (2008) stated that they observed two saltwater crocodiles, nearly 4 m long, in a marshy area in the upper Ord river, south of its junction with Bow river (in the southernmost part of the lake). In July 2010, a helicopter survey of crocodiles spotted an approximately 3 m saltwater crocodile near Ridgepole creek in the southern part of the Lake (WMI 2010).

Considering the thousands of hours people spend in waters associated with freshwater crocodiles, the number of reported attacks are trivial. Nonetheless it appears certain that, whether by accident or design, attacks do happen and serious injuries do occur. It is therefore important that freshwater crocodiles are treated with the utmost respect and due care and attention is taken when in their known habitats.

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